

P804593/WO/1

- 1 -

Daimler Chrysler AG

5

Control system for a motor vehicle

The invention relates to a control system for a motor vehicle according to the preamble of patent claim 1.

10

In modern vehicles, multimedia control systems are being increasingly used. An example of this is the command system in the Mercedes Benz S-class.

- 15 DE 197 52 056 A1 describes a control system of the generic type, in particular for a motor vehicle. In this control system, two display areas are displayed on a screen display in a menu structure with a plurality of menu levels. A first display area is arranged as a
- 20 frame around the second display area. In a first menu level, eight fields with entries which correspond to applications which can be carried out and which are arranged vertically and horizontally are displayed in the first display area. An entry is selected by means
- 25 of a pushing or tilting movement of the manual actuating means with a plurality of degrees of freedom of adjustment in the direction of the position of the corresponding entry in the first display area. A selected entry is activated by pressing the manual
- 30 actuating means. After the activation, a plurality of vertically arranged entries which are assigned to the activated entry in the first menu level are displayed in a second menu level in the second display area. The entries displayed in the second display area are
- 35 selected by means of rotational movement of the manual actuating means and activated by pressing the manual actuating means. The activated second display area and the second menu level are exited by means of the

pushing or tilting movement of the manual actuating means in the direction of a position of one of the entries in the first display area. The control system is then located in the first menu level in the first display area again.

The object of the invention is to specify an improved control system for a motor vehicle which permits intuitive control and which reduces the scope of distracting information.

The invention achieves this object by making available a control system having the features of Patent Claim 1.

Advantageous developments of the invention are specified in the dependent claims.

The invention is based on the idea that at least two degrees of freedom of adjustment of a manual actuating means move a cursor in order to select and/or activate one of the entries in an active display area, a first degree of freedom of adjustment corresponding to a rotational movement of the manual actuating means in the clockwise direction about a z axis which is perpendicular to the xy plane, a second degree of freedom of adjustment corresponding to a rotational movement of the manual actuating means in the counter clockwise direction about a z axis which is perpendicular to the xy plane, a direction of movement of the cursor in the active display area which is brought about by the first and/or second degree of freedom of adjustment of the manual actuating means being dependent on the orientation of the entries displayed in the active display area.

The inventive assignment of the direction of movement of the cursor to the rotational movement of the manual actuating means as a function of the orientation of the

entries within the active display area permits intuitive control of the respective active display area. As a result, the control processes for the user are simplified and the cognitive load is reduced so  
5 that the user can concentrate better on the events on the road.

In a refinement of the invention, the individual display areas and/or the fields with the entries can  
10 be arranged with a vertical orientation in a y direction and/or with a horizontal orientation in an x direction in the individual display areas on the screen display.

15 When the entries are orientated vertically in the active display area, the first degree of freedom of adjustment brings about, for example, a movement of the cursor in the negative y direction, and the second degree of freedom of adjustment brings about a movement  
20 of the cursor in the positive y direction.

When the entries are oriented horizontally in the active display area, the first degree of freedom of adjustment brings about a movement of the cursor in the  
25 positive x direction, and the second degree of freedom of adjustment brings about a movement of the cursor in the negative x direction.

In a further refinement of the invention, at least four  
30 further degrees of freedom of adjustment of the manual actuating means move the cursor in order to select and/or activate one of the display areas and/or the entries in the active display area on the screen display, the direction of movement of the cursor on the  
35 screen display corresponding to an instantaneous actuation direction of the manual actuating means which is actuated in accordance with one of the four further degrees of freedom of adjustment.

- A third degree of freedom of adjustment corresponds, for example, to a pushing movement of the manual actuating means in the positive y direction, and a
- 5 fourth degree of freedom of adjustment corresponds, for example, to a pushing movement of the manual actuating means in the negative y direction. A fifth degree of freedom of adjustment corresponds, for example, to a pushing movement of the manual actuating means in the
- 10 positive x direction, and a sixth degree of freedom of adjustment corresponds, for example, to a pushing movement of the manual actuating means in the negative x direction.
- 15 In one advantageous development of the invention, the direction of the pushing movement of the manual actuating means for selecting and/or activating one of the entries within the active display area corresponds to the orientation of the entries in the active display
- 20 area. In order to exit the active display area, the pushing movement of the manual actuating means is orthogonal with respect to the orientation of the entries in the active display area.
- 25 The pushing direction of the manual actuating means for selecting and/or activating a display area corresponds to the orientation of the display areas on the screen display.
- 30 The described assignment of the further degrees of freedom of adjustment of the manual actuating means to the orientation of the arrangement of the entries further improves the intuitive control of the menu structure and the intuitive exiting of the active
- 35 display area. As a result, the control processes for the user are simplified further and the cognitive load is reduced further.

The activation of a selected entry can be carried out for example, by a seventh degree of freedom of adjustment of the manual actuating means and/or as a function of a current system state which is determined by a control and evaluation unit. These vehicle systems  
5 comprise, for example, a navigation system with a locating unit, a heating system and air conditioning system, a cellular telephone, a video system, an audio system etc.

10

In order to give the display areas visually clear configuration, when there are a plurality of entries in a display area, the width of the individual fields when the entries are arranged horizontally can be made  
15 adjustable in a variable fashion on the length of the respective entry, and when the entries are arranged vertically said width can be made adjustable in a variable fashion on the length of the longest entry.

20 Alternatively or additionally, the field width when entries are arranged horizontally can be dependent on the number of entries to be displayed in this display area.

25 In order to enhance the effect of intuitive control, in one advantageous development of the invention the screen display can comprise at least a first display area which has a constant graphic basis structure over all the menu levels of the menu structure, that is to  
30 say the entries in this at least one display area have a constant horizontal and/or vertical arrangement over all the menu levels.

In order to control the various applications in a  
35 detailed fashion it is possible to provide at least a second display area on the screen display, which second display area has a variably adjustable graphic basic

structure as a function of an active menu level of the menu structure.

5 In one advantageous configuration of the invention, as a function of an activation of one of the entries in the individual menu levels of the menu structure, submenus which are dependent on this entry in at least one further level of the menu structure can be opened, and by activating at least one of the display areas can  
10 be displayed in said area.

The opened submenu can, for example, be displayed only in the active display area or in at least one other of the display areas by means of an overlap of the graphic  
15 basic structure.

A plurality of submenus, preferably two, can be displayed simultaneously on the screen display in the at least one further menu level of the menu structure.

20 When the entries are orientated vertically in the submenus, the plurality of submenus can, for example, be displayed one next to the other.

25 In one advantageous configuration of the invention, a first of the plurality of submenus can be opened and displayed in the first menu level of the menu structure as a function of an activation of an entry, and a second of the plurality of submenus can be opened and  
30 displayed as a function of an activation of an entry in the associated first submenu.

The opened submenus can be closed simultaneously, for example, by means of a pushing movement of the manual  
35 actuating means orthogonally with respect to the orientation of the entries of the active submenu away from the adjacent submenu. Furthermore, it is possible to provide that only the active, i.e. the second

submenu is closed, and the adjacent, i.e. the first submenu for a new selection of an entry, is activated by means of a pushing movement of the manual actuating means orthogonally with respect to the orientation of the entries of the active submenu in the direction of the adjacent submenu.

The number and/or the graphic display and/or contents of the entries to be displayed in the display areas can be variable and/or constant as a function of current system states, such as for example a passenger compartment temperature which is currently determined by sensors of the heating system and air conditioning system, a determined reception strength of an antenna for the cellular telephone, the fact that a position predefined in the navigation system is reached etc., and/or of a current menu level and/or of a currently activated application.

A presettable application can be displayed in at least one of the first display areas, the number and the position of the entries to be displayed being constant as a function of the preset application, and the contents and the graphic display of the entries to be displayed being variable and/or constant as a function of current system states.

In one advantageous configuration, at least one of the first display areas is configured as a status bar with at least one horizontally arranged field for displaying at least one status. The number, the position, the contents and the graphic display of the entries to be displayed are variable as a function of current system states and/or application states.

At least one of the first display areas can be configured as an application line for displaying an application group with various selectable and

predefinable applications, in particular an audio application, navigation application, communications application, video application and vehicle application. The number and position of the entries to be displayed  
5 are constant, and the graphic display of the entries to be displayed is configured in a variable manner as a function of an activated application.

At least one of the second display areas can be  
10 configured as an application area for displaying details and controlling a selected and activated application. The number and the position and the graphic display of the entries to be displayed are dependent on the activated application.

15 At least one of the first display areas can be configured as a subfunction line for displaying and selecting functions and/or subfunctions and/or options of an activated application. The number and the  
20 position and the graphic display of the entries to be displayed are independent on the activated application.

The graphic display of the cursor is dependent, for example, on the active display area and/or on an active  
25 application and/or on an active menu level.

The cursor may be displayed graphically, for example, as an independent object on the screen display or by changing the graphic display of a current selected  
30 field.

Advantageous configurations of the invention are displayed in the drawings and are described below.

35 In the drawings:

Fig. 1 is a block circuit diagram of a control system for a motor vehicle;



- Fig. 2 is a schematic illustration of a screen display from Fig. 1 in a first menu level;
- Fig. 3 is a schematic illustration of a screen display from Fig. 1 in a first menu level;
- 5 Fig. 4 is a schematic illustration of the screen display from Fig. 1 in a second menu level;
- Fig. 5 is a schematic illustration of the screen display from Fig. 1 in a third menu level;
- Fig. 6 is a schematic illustration of the screen display from Fig. 1 in a further menu level;
- 10 Fig. 7 is a schematic illustration of the screen display from Fig. 1 with entries in the menu level from Fig. 6 which are adapted to the control for a motor vehicle;
- 15 Fig. 8 is a schematic, alternative illustration of the screen display from Fig. 1 in the second menu level;
- Fig. 9 is a schematic illustration of the screen display from Fig. 1 showing a submenu closing process;
- 20 Fig. 10 is a schematic illustration of the screen display from Fig. 1 showing a submenu closing process;
- Fig. 11 is a schematic illustration of the screen display from Fig. 1 showing a submenu closing process;
- 25 Fig. 12 is a first schematic illustration of submenus on the screen display from Fig. 1;
- Fig. 13 is a further first schematic illustration of submenus on the screen display from Fig. 1;
- 30 Fig. 14 is a second schematic illustration of submenus on the screen display from Fig. 1;
- Fig. 15 is a further second schematic illustration of submenus on the screen display from Fig. 1;
- 35 Fig. 16 is a third schematic illustration of submenus on the screen display from Fig. 1;
- Fig. 17 is a further third schematic illustration of submenus on the screen display from Fig. 1;

Fig. 18 is a further third schematic illustration of submenus on the screen display from Fig. 1; and

5 Fig. 19 is a schematic illustration of the screen display from Fig. 1 in a further submenu.

As is apparent from Fig. 1, the control system 1 for a motor vehicle comprises a screen display 2, a manual actuating means 3, a control and evaluation unit 4 and  
10 a plurality of vehicle systems such as a navigation system, a heating system and an air conditioning system, a cellular telephone, a video system, an audio system etc. which are illustrated combined as one element 5. The vehicle systems transmit signals to the  
15 evaluation and control unit 4 from which the control and evaluation unit 4 determines current system states. All the applications and/or functions and/or subfunctions and/or options and/or status displays in various menu levels of a menu structure are controlled  
20 by means of the manual actuating means 3. The latter has seven degrees of freedom of adjustment for selecting and/or activating entries displayed in an active display area. Said actuating means 3 can be pushed in four directions according to the arrow  
25 illustration in Fig. 1, i.e. in a positive x direction, a negative x direction, in a positive y direction or in a negative y direction. In addition, it can be rotated in the clockwise direction or in the counter clockwise direction about a z axis (not illustrated) which is  
30 perpendicular to the plane of the drawing, and can be pressed in the direction of the negative z direction, i.e. into the plane of the drawing.

Rotating the manual actuating means 3 in the clockwise  
35 direction causes a cursor on the screen 2 to move to the right or downward as a function of a horizontal or vertical orientation of the entries displayed on the screen display 2, and turning in the counter clockwise

direction causes the cursor to move to the left or upward. Pushing the manual actuating means 3 in Fig. 1 upward, i.e. forward in the direction of the windshield, i.e. in the positive y direction, causes the cursor on the screen display 2 to move upward, and the pushing process in the downward direction in Fig. 1, i.e. toward the rear in the negative y direction, causes the cursor on the screen display 2 to move downward. Pushing to the right, i.e. in the positive x direction, causes the cursor on the screen display 2 to move to the right, and pushing to the left, i.e. in the negative x direction, causes the cursor to move to the left.

15 The selection and/or activation of an entry displayed on the screen display 2 are carried out by pushing or turning the manual actuating means 3. In order to select and/or activate an entry within an active display area, the manual actuating means 3 can be pushed redundantly in order to rotate about a z axis perpendicular to the xy plane, along an axis, i.e. in the positive and/or negative y direction, or horizontally along an axis, i.e. in the positive and/or negative x direction. The corresponding rotational and/or pushing movement of the manual actuating means 3 in order to select an entry corresponds here according to the invention to the orientation of the entries displayed in the active display area. When the entries are orientated horizontally in the active display area, a rotational movement in the clockwise direction or a pushing movement to the right in the positive x direction causes the cursor on the screen display 2 to move to the right in the positive x direction, and rotational movement in the counter clockwise direction or a pushing movement to the left in the negative x direction causes the cursor on the screen display 2 to move to the left in the negative x direction. When the entries are oriented vertically in the active

display area, a rotation movement in the clockwise direction or a pushing movement downward in the negative x direction causes the cursor on the screen display 2 to move downward in the negative y direction, and a rotation movement in the counter clockwise direction or a pushing movement upward in the positive y direction causes the cursor on the screen display 2 to move upward in the positive y direction. The pushing direction which is respectively orthogonal with respect to the selection pushing direction causes the active display area to be exited. In addition, in order to activate a selected entry it may be necessary to press the manual actuating means 3.

As is clear from Fig. 2, the screen display 2 comprises, in a first menu level, a graphic basic structure of five vertically arranged, horizontal display areas 210 to 250. This graphic basis structure is constant over the multiplicity of various menu levels of the menu structure. The screen display 2 is configured, for example, as an eight inch screen with a ratio of the sides of 15:9. The graphic basic structure of at least a first of the display areas 210 to 250 of the screen display 2 is constant over the multiplicity of various menu levels of the menu structure. In Fig. 2, the display areas 210, 220, 240 and 250 are configured as such first display areas.

The graphic basis structure of at least a second of the display areas 210 to 250 is variable over the multiplicity of various menu levels of the menu structure as a function of an activated application and/or function and/or subfunction and/or option and/or status display. In Fig. 2, the display area 230 is configured as such as second display area. This central display area 230 may be configured graphically in very different ways.

One or more horizontally arranged entries 1.1 to 5.7 may be respectively displayed in the four display areas 210, 220, 240 and 250 which are configured as first display areas. For example, the display areas 210, 220, 5 240 and 250 in Fig. 2 in the first menu level each comprise a different number of entries. For example, the first display area 210 comprises two entries 1.1, 1.2, the second display area 220 comprises five entries 2.1 to 2.5, the fourth display area comprises no entry 10 and the fifth display area comprises seven entries 5.1 to 5.7. In Fig. 2, the first display area 210 is activated and the hatched entry 1.1. is selected. The hatched display is intended to indicate that the cursor is positioned on the entry 1.1.

15

The entries 1.1 to 5.7 of the display areas 210 to 250 displayed on the screen display 2 can be arranged according to the importance of their contents or their frequency of application.

20 Basically, all the displayed entries 1.1 to 5.7 can be selected with the manual actuating means 3. Only a small number of status displays and options which are not available at certain times are exempted. It is not possible to select all the displayed entries by 25 rotating. Displayed entries 1.1, 1.2 can be selected directly by rotating only within an active display area, here the first display area 210. In order to select the entries 2.1 to 5.7 of the other display areas 220 to 250, are firstly activated by pushing the 30 manual actuating means 3 orthogonally with respect to the orientation of the entries 1.1 in the graphically highlighted active display area 210. The activity state, i.e. the possibility of directly selecting a display area 210 to 250 or individual entries is 35 displayed, for example, by different colouring and graphic elements. The active display area 210 in which the displayed entries 1.1, 1.2 can be selected and/or activated by means of rotational movement can be

marked, for example, by means of a frame around the active display area 210.

In at least one of the display areas 210 to 220, the  
5 cursor is not an independent object on the screen  
display 2 but rather assumes the shape of the field in  
which it is positioned. In the described configuration,  
this applies to the first, second, fourth and fifth  
display areas 210, 220, 240, 250. The cursor is  
10 displayed by changing the graphic display of the field  
on which it is positioned, for example by changing the  
colour of the background of the respective entry 1.1 to  
5.7, with the inversion of the colours of the display  
of the entry 1.1 to 5.7. The positioning of the cursor  
15 on a field represents the selection of the entry  
associated with this field. It is possible to depart  
from this display if a parameter setting can already be  
implemented by rotating or pushing the cursor, or if  
the entry is displayed graphically instead of as text.  
20 In this case, the cursor is displayed with a different  
graphic form. This type of cursor display can be  
limited spatially to the third display area 230.

The width of the cursor in the horizontally orientated  
25 display areas 210, 220, 240, 250 corresponds to the  
width of a field with an entry and can be determined,  
for example, according to the number of entries 1.1 to  
5.7 in the respective display area 210, 220, 240, 250.  
When there are one or two entries 1.1 to 5.7 in the  
30 respective display area 210, 220, 240, 250, the field,  
and thus cursor can assume half the width of the screen  
display 2. When there are more than two entries in one  
of the horizontally orientated display areas 210, 220,  
240, 250, the screen display 2 can be divided among the  
35 fields with entries, the field width of the individual  
fields and the thus the cursor width being adapted to  
the width of the entries in the individual fields. The  
screen display 2 is generally divided in such a way

that the fields with entries are directly adjacent to one another.

5 In vertically orientated display areas which are configured, for example as lists or submenus, the field width and thus the cursor width corresponds to the width of the list, the width of the list being determined, for example, by the longest entry in the list.

10

The cursor is always positioned within what is referred to as an active display area 210 to 250, i.e. in a display area 210 to 250 which can be controlled directly and in which one of the entries can be  
15 selected and/or activated by rotating and pushing the manual actuating means 3 either horizontally or vertically as a function of the orientation of the entries 1.1 to 5.7. This active display area 210 to 250 is orientated either vertically or horizontally.

20

The entries of the active display area 210 to 250 can be highlighted through colour, for example by a light script and/or icons and/or graphics on a dark background. In addition, this display area can be  
25 delimited by a horizontal or vertical light line which serves, for example, to indicate the direction of rotation. In the third display area 230, the activation state can be displayed by means of a highlighted entry and/or by means of the highlighted cursor.

30

The display areas 210 to 250 which are not directly active can be displayed in a graphically subdued fashion, for example by means of a different colour and/or different intensity. These unactivated displayed  
35 areas 210 to 250 can be selected by respectively orthogonally pushing the manual actuating means 3 with respect to the orientation of the entries in the active display area 210 to 250.

Entries which cannot be selected for a certain time can nevertheless be displayed, for example, in an attenuated form with colour contrast. The cursor cannot  
5 be moved onto such entries. These entries can, for example, be jumped over or the movement of the manual actuating means 3 can be limited, for example, in the form of a stop, which prevents the cursor being moved onto the field which cannot be selected.

10

Fig. 3 shows the screen display 2 in the first menu level after the actuating means 3 has been pushed from the display state in fig. 2 in the negative y direction. Specifically, as a result of this the second  
15 display area 220 in fig. 3 is active and the entry 2.1 is selected.

Fig. 4 shows the screen display 2 in a second menu level after the entry 2.2 in the second display area  
20 220 has been selected by rotationally moving the manual actuating means 3 in the clockwise direction or by pushing the manual actuating means 3 in the positive x direction, and has been activated by pressing the manual actuating means 3. The activation of the entry  
25 2.2 activates the second menu level and the fourth display area 240 in which three horizontally arranged entries 4.1 to 4.3 are displayed. The entries 4.1 to 4.3 are assigned to the entry 2.2 of the second display area 220 and can be selected with the manual actuating  
30 means 3. The entry 4.3 is selected in Fig. 4. The active state of the entry 2.2 and the selected state of the entry 4.3 are indicated by the hatched display.

Fig. 5 shows the screen display 2 in a third menu level  
35 after the entry 4.3 in the fourth display area 240 has been activated by pressing the manual actuating means 3. Activating the entry 4.3 activates the third menu level and the third display area 230 in which a submenu



in the form of a further display area 230.1 with four horizontally arranged entries 3.1 to 3.4 is then opened, activated and displayed. The opened submenu 230.1 and thus the entries 3.1 to 3.4 are assigned to the entry 4.3 of the fourth display area. The entries 3.1 to 3.4 can be selected with the manual actuating means 3. In Fig. 5, the entry 3.1 is selected. The active state of the entries 2.2 and 4.3 and the selected state of the entry 3.1 are indicated by the hatched display.

Fig. 6 shows the screen display 2 in a further menu level after the entry 3.2 in the third display area 230 has been activated by the rotational movement in the clockwise direction or by pushing in the x direction and by pressing the manual actuating means 3. Activating the entry 3.2 activates the further menu level and a further display area 230.2 within the third display area 230. The display area 230.2 is configured as a further submenu in the form of a vertical list with entries 3.2.1 to 3.2.3. The opened submenu 230.2 and thus the entries 3.2.1 to 3.2.3 are assigned to the entry 3.2 in the submenu 230.1 of the third display area 230. The entries 3.2.1 to 3.2.3 can be selected with the manual actuating means 3 by means of a rotational movement in the clockwise direction or in the counter clockwise direction about the z axis or by means of a pushing movement in the positive or negative y direction, the rotational movements or the pushing movements causing the cursor to move either in the positive y direction or the negative y direction. In Fig. 6, the entry 3.2.2 is selected. The active state of the entries 2.2, 4.3 and 3.2 and the selected state of the entry 3.2.2 are indicated by the hatched display.

Fig. 7 shows a schematic illustration of the screen display 2 from Fig. 1 with specific entries in the menu

level from Fig. 6 which have been adapted to the control for a motor vehicle. As is apparent from Fig. 7, the first display area 210 is configured as a status line which presents various status displays S1 to S7 from different applications. The main function of the status line is to display important current system states which are determined by the control and evaluation unit 4 as a function of signals from the vehicle systems 5. The entries or status displays S1 to S7 can be selected and activated with the manual activating means 7. In order to determine the current system states, for example the signals from the navigation system with a locating unit, from the heating and air conditioning system, from the cellular telephone, from the video system, from the audio system, etc. are evaluated. In the status line it is indicated, for example, whether a traffic radio transmitter is activated, whether the heating and air conditioning system is operating in recirculation mode or fresh air mode, whether the activated carbon filter is activated etc.

The first display area 210 which is embodied as a status line may contain a plurality of controllable and noncontrollable entries S1 to S7 which are included in the display or removed from it as a function of the system state. The possibility of controlling some entries can permit direct access to important functions without making it necessary to change the application. If an entry is selected from the status line, this can lead directly to an associated function. For example, by actuating a letter symbol a display area in a ComTel application, i.e. in a communications application or telephone application, can be activated and opened. Activating a telephone receiver symbol can activate and open another display area in the ComTel application group. Activating a TP symbol deactivates a traffic program. i.e. a traffic radio transmitter. In addition,

various nonselectable status displays such as a satellite key for displaying the GPS reception or a field strength can be provided.

- 5 The second display area 220 is configured as an application line for displaying an application group with various selectable and predefinable applications Appl. 1 to Appl. 5, in particular an audio application, navigation application, communications application,  
10 video application and a vehicle application, the number and position of the entries to be displayed, i.e. if the applications Appl. 1 to Appl. 5, being constant and the graphic display of the entries to be displayed being variable as a function of an activated  
15 application. Activating one of the applications Appl. 1 to Appl. 5 which is not already active brings about a changeover into the associated application and activates the fourth display area 240 for displaying subfunctions SubF 1 to SubF 3 which are associated with  
20 the active application. If an application does not have subfunctions, the third display area 230 can be activated by activating this application in the second display area 220, and the options relating to control which are associated with this application are  
25 displayed.

The arrangement of the application groups in the second display area 220 is constant and can be ordered from left to right according to the frequency of use of  
30 importance. Selecting an application or application group causes at least one other display area to be activated directly.

- 35 The third display area 230 is configured as an application area for displaying details and controlling a selected and activated application. The number and position and the graphic display of the entries to be displayed, in this case of options Opt. 3.1 to Opt. 3.4

and Opt. 3.2.1 to Opt. 3.2.3 are dependent on the activated application Appl. 1 to Appl. 5. The graphic display and controllability of the third display area 230 is variable and can therefore be satisfactorily adapted to a greatly varying functionality or requirements of the various applications Appl. 1 to Appl. 5.

The fourth display area 240 is configured as a subfunction line for displaying and selecting functions and/or subfunctions and/or options of an activated application Appl. 1 to Appl. 5. The number and position and the graphic display of the entries to be displayed, i.e. for the subfunctions SubF 1 to SubF 3, are dependent on the activated application Appl. 1 to Appl. 5. The graphic basic structure is constant over all the menu levels of the menu structure.

The fifth display area 250 is configured as a main application line. A presettable application can be displayed in this display area 250. The number and the position of the entries HA1 to HA7 to be displayed are constant for the preset application, and the contents and the graphic display of the entries HA 1 to HA 7 to be displayed are variable and/or constant as a function of current system states. The preset application is preferably used to control an air conditioning system in the vehicle. The graphic display of the entries HA1 to HA7 is provided in the form of text fields and/or icons. The position and number of these text fields and/or icons are constant. The displayed values of a set parameter such as, for example, air temperature, blower strength etc. may vary.

The current system states relate in particular to relevant states for controlling the temperature in the passenger compartment of the vehicle such as, for example, external temperature, intensity of solar

radiation, temperature of the passenger compartment, air humidity etc.

5 In the screen display 2 illustrated in Fig. 7, the second application Appl. 2, the third subfunction SubF 3 and the second option 3.2 are activated and the option 3.2.2 is selected, which is indicated by hatched display of the corresponding fields.

10 Fig. 8 shows a further display of the screen display 2 in the second menu level. In contrast to Fig. 4, the fifth display area 250 in Fig. 8 is active and entry 5.1 is activated. Activating the entry 5.1 activates the third display area 230 with a further display area  
15 230.3. The latter serves to set a horizontally arranged parameter. The parameter is set by rotating the manual actuating means 3 about the z axis or by pushing it in the x direction. The instantaneously set parameter value is determined by the last continuous vertical  
20 bar. The vertical bars which are displayed as dashes indicate further possible settable parameter values. The settable parameter is, for example, a desired temperature of the passenger compartment. The vertical bars then correspond to various temperature values.

25 Fig. 9 shows the screen display 2 in the third menu level with an opened submenu 230.4 within the third display area 230. In the illustrated submenu 230.4, an option 3 is selected. Submenu 230.40 is assigned to the  
30 subfunction SubF 3 which is assigned to the application Appl. 3.

Fig. 10 shows the screen display 2 in a fourth menu level which is activated by activating an option 3 in  
35 the submenu 230.4 from Fig. 9. A further submenu 230.5 is opened and activated in Fig. 10. As is apparent from Fig. 10, the submenu can extend over the full height of the screen display 2. If a submenu is configured as a

list with text entries, the number of the entries can be unlimited, the number of entries which can be viewed at maximum being limited, for example to nine entries. When there are more than nine entries, an entry can be  
5 selected by scrolling. The indication that further entries which cannot be viewed are present can be provided by means of arrows.

The selection of the first submenu 230.4 which is  
10 illustrated in Fig. 9 changes the colour and/or graphic representation of the display areas 210 to 250 on the screen display 2. The position of the cursor on the screen display 2 is displayed graphically by means of colour. The display area 240 from which the first  
15 submenu 230.4 has been called is subdued in terms of colour compared to the active display area 230. All the other display areas 210, 220, 240 and 250 are graphically in the background. This principle is maintained when further submenus 230.5 from Fig. 10 are  
20 opened, i.e. the entire path is indicated by colour, while the other options are subdued graphically. The path is highlighted in the figures in each case by means of the hatched display of the corresponding selected or activated entries. This display principle  
25 is used to indicate the entries which the user accesses if he respectively pushes the control element 3 orthogonally with respect to the active display area in the direction from which the menu is opened.

30 The possible activation states of the display areas 210 to 250 comprise and display a directly controllable display area, a display area from which an active display area has been called and all the other display areas.

35

Entries 1 to 9 in the submenu list 230.5 show further display possibilities of activation states of functions. The entries 1 to 6 comprise selection boxes

which indicate whether or not the corresponding entry is activated. The entries 1 to 6 may be activated independently of one another. Pressing the manual actuating means 3 causes the box to be filled with a square, and pressing the manual actuating means 3 again  
5 deletes the square from the box and deactivates the associated entry 1 to 6.

The displayed entries 7 to 9 can only be activated in  
10 an exclusively individual fashion. The activation state is displayed by a filled-in circle. The activation can also be carried out by pressing the manual actuating means 3.

15 The activated submenu is exited, for example, by activating an entry with deletion of the function from the submenu or by horizontally pushing the manual actuating means 3 orthogonally with respect to the orientation of the entries in the submenu and thus in  
20 the active display area.

If, for example, in the screen display 2 illustrated in Fig. 10, the manual actuating means 3 is pushed in the negative x direction, i.e. in the direction of the path  
25 on which the submenu 230.4 has been activated and opened, the submenu 230.5 is exited and the submenu 230.4 is activated again. The cursor is then positioned, for example on the entry from which it was activated, i.e. on the option 3 in the submenu 230.4.  
30 The display on the screen display 2 then corresponds again to the display in Fig. 9.

If in the screen display 2 illustrated in Fig. 10 the manual actuating means 3 is pushed in the positive x  
35 direction, both the second submenu 230.5 and the first submenu 230.4 are exited and closed and the display area 240 from which the first submenu 230.4 was activated is activated again. The cursor is then

positioned, for example, on the entry from which the first submenu 230.4 was activated, i.e. on the entry SubF 3 in the display area 240. This display on the screen display 2 is shown in Fig. 11.

5

Figs. 12 to 18 show various further forms of display of activated submenus on the screen display 2.

Fig. 12 shows a display area 220.1 which is opened by activating the entry 2.2 in the second display area 220. The submenu which is displayed in the display area 220.1 comprises two entries Ein1 and Ein2 in Fig. 12. The displayed entry list of the submenu is, as is apparent from Fig. 13, filled in from top to bottom if a plurality of entries Ein1 to Ein9 are present. An arrow 221 indicates that there are even more entries in the submenu list which can be selected.

Fig. 14 shows a display area 240.1 which is opened by activating the entry 4.1 in the fourth display area 240. The submenu displayed in the display area 240.1 comprises two entries 1 and 2 in Fig. 14. The displayed entry list of the submenu is, as is apparent from Fig. 15, filled in from bottom to top if a plurality of entries 1 to 9 are present. An arrow 241 indicates that even more entries which can be selected are present in the submenu list.

Fig. 16 shows a display area 230.7 which has been opened by activating the entry 3.3 from a first submenu 230.6 in the third display area 230. The second submenu displayed in the display area 230.7 comprises two entries 1 and 2 in Fig. 16. The displayed entry list of the second submenu 230.7 is, as is apparent from Fig. 17, firstly filled in from top to bottom from a vertical position of the activating entry 3.3 of the submenu 230.6 until all the possible fields in the downwards direction are filled with entries 1 to 4,



then, the list is filled in from bottom to top, as shown in Fig. 18, if a plurality of entries 3 to 11 are present. Arrows 231 indicate that even more entries which can be selected are present in the submenu list.

5

Fig. 19 shows, for example, various display areas 230.7 to 230.11 for setting parameters in the third display area 230. Two display areas 230.7 and 230.8 are used to set vertically arranged parameters Para 1 and Para 2. 10 Two display areas 230.9 and 230.10 serve to set horizontally arranged parameters Para 3 and Para 4. The parameters Para 1 to Para 4 represent, for example, sound functions such as base, tones, volume etc. in an audio application. The display area 230.11 serves for 15 simultaneously setting two parameters Para 5 and Para 6. Because this setting is implemented as cross hairs 232, the current value of the parameter Para 5 is displayed by the horizontally arranged bar and the current value of the parameter Para 6 is displayed by 20 the vertically arranged bar. The parameter Para 5 is set by vertical pushing, and the parameter Para 6 by horizontal pushing of the manual actuating means 3. There is no provision for the parameters Para 5 and Para 6 to be set with a rotational movement in the 25 illustrated exemplary configuration. However, it is possible to permanently assign the rotational movement to one of the two parameters Para 5 or Para 6 in the display area 230.11. If the rotational movement is permanently assigned, for example, to the parameter 30 Para 5, the parameter Para 5 can be changed by means of rotational movement or by means of a pushing movement in the y direction. The parameters Para 5 and Para 6 represent, for example, Balance and Fade sound functions in the audio application. This menu is exited 35 by pressing the manual actuating means 3 again. When setting a parameter, the currently set parameter values are stored by pressing the manual actuating means 3 and the activated display area 230.11 is exited. In the

illustrated exemplary configuration, the individual display areas 230.7 to 230.11 within the third display area 230 can be selected and/or activated only by means of a pushing movement of the manual actuating means 3 in the x direction. If one of the display areas 230.7 to 230.10 is activated, the parameter which is assigned to the active display area can be set by means of a rotational movement or pushing movement of the manual actuating means 3 in accordance with the orientation of the respective parameter. A rotational movement in the clockwise direction in the display areas 230.7 and 230.8 thus moves the cursor downwards in the negative y direction, and a rotational movement in the counter clockwise direction moves the cursor upwards in the positive y direction. A pushing movement in the positive or negative y direction correspondingly moves the cursor in the display areas 230.7 and 230.8 in the positive or negative y direction. In the display areas 230.9 and 230.10, a rotational movement in the clockwise direction moves the cursor to the right in the positive x direction, and a rotational movement in the counter clockwise direction moves the cursor to the left in the negative x direction. A pushing movement in the positive or negative x direction correspondingly moves the cursor in the display areas 230.9 and 230.10 in the positive or negative x direction.

The configurations described with respect to the drawings show that the invention can be used to control a very wide variety of applications and/or functions. The inventive assignment of the degrees of freedom of adjustment of the manual actuating means, remains the same over the various menu levels, for the purpose of orientating the arrangement of the entries in the respective active display area and the restricted number of degrees of freedom of adjustment allows the user to know intuitively how he can select and activate an entry in the respective active display area or exit

the active display area. As a result, the control processes are simplified for the user and the cognitive load is reduced so that the user can concentrate better on the events on the road.